Transportation

If pit production were phased-out at LANL, there would be no need to transport pits from LANL to Pantex for weapons assembly. This would eliminate 28 shipments per year. As described in Section 5.2.12, the impact associated with transportation to and from LANL is approximately 1.9×10^{-3} LCFs per year for incident-free transport. Eliminating this impact is not considered significant.

Accidents

If pit production were phased out at LANL, there would be no potential impacts from accidents associated with pit production. The potential impacts associated with pit production at LANL are described in Appendix C and Section 5.2.10. These impacts, while small, would be eliminated.

5.8 CUMULATIVE IMPACTS

5.8.1 Introduction

The CEQ regulations implementing the NEPA define cumulative effects as "the impact on the environment which results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." Other DOE programs and other Federal, state, and local development programs all have the potential to contribute to cumulative effects on DOE sites.

The methodology for the analysis of cumulative effects is presented in Appendix F and was developed from the guidelines and methodology in the CEQ's *Considering Cumulative Effects Under the National Environmental Policy Act*. Cumulative impacts are presented for those resource areas having the potential to present a significant impact. Each potential site is examined separately for cumulative impacts, and generally the alternative with the maximum impact (MPF with 450 ppy) is presented as the bounding impact to cumulative effects. For some resource areas, such as waste management, the cumulative effect may only be the impact from the MPF project combined with the impact (if any) from existing operations.

5.8.2 Los Alamos Site

The No Action Alternative provides the baseline for the cumulative effects of the Proposed Action at LANL. The projected incremental environmental impacts of implementing the Proposed Action at LANL were added to the impacts of other present, past, and reasonably foreseeable future actions at or near LANL to obtain the cumulative impacts.

Primary sources of information for cumulative impacts at LANL, include the following DOE documents:

- *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory* (draft EIS currently in production) (DOE 2003)
- *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory*, DOE/EIS-0319, August 2002 (DOE 2002k)
- *Site-wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, DOE/EIS-0238, January 1999 (DOE 1999a)
- *Final Supplement Analysis for Pit Manufacturing Facilities at Los Alamos National Laboratory, Stockpile Stewardship and Management Programatic Environmental Impact Statement*, DOE/EIS-0236/SA-6, September 1999 (DOE 1999f)
- *Environmental Surveillance at Los Alamos during 2001*, LA-13979-ENV, September 2002 (LANL 2002b)

The Los Alamos Laboratory's original mission in 1943 was to build the world's first nuclear weapon. In 1981, the laboratory was designated as a national laboratory and became LANL. Following World War II, activities focused on nuclear defense and development, but expanded to include nuclear energy and other high-technology civilian research and development.

At LANL, resources that may reasonably be expected to be affected by the Proposed Action include electrical consumption, water use, air quality, human health and safety, transportation, and waste management.

Resource Requirements Impacts

At LANL, both peak-load electrical capacity and available water capacity would be exceeded in the future regardless of the addition of the MPF Alternative. For all projected uses of electrical power and water supply (including non-LANL users) over the next 50 years, LANL would require approximately 120 percent of the current peak load capacity, 95 percent of its total available capacity (DOE 2003), and 142 percent of the available water capacity (DOE 2003). Compared to the No Action Alternative, operation of the MPF Alternative (producing 450 ppy) would result in a 36 percent increase in total electrical energy consumption, 44 percent in peak load electrical energy consumption, and a 29.5 percent increase in water consumption. For the near term, no electrical or water resource capacity constraints are expected, because LANL operational demands have been well below projected levels and within site capacities (DOE 2003).

DOE is currently pursuing a project to increase the availability and reliability of LANL's electrical power supply by the addition of new gas-fired combustion turbine generators at the TA-3 Co-generation Complex. This project will increase LANL's onsite electric generation by 40 MW after FY2007 (DOE 2003).

For water supply, Los Alamos County is the primary water supplier serving LANL. DOE transferred ownership of 70 percent of its water rights to the county and leases the remaining 30 percent. Los Alamos County is currently pursuing the use of San Juan-Chama Transmountain

Diversion Project water to secure additional water rights and supply for its remaining water customers. Any potential shortfalls in available water capacity would be addressed as demand increases (DOE 2003).

Air Quality Impacts

Cumulative impacts on air quality at LANL would be the same as discussed in the LANL SWEIS. LANL would continue to be in compliance with all Federal and state ambient air quality standards. The effects of air quality from other proposed actions at LANL would not result in cumulatively significant impacts. Effects on air quality from associated construction and excavation activities would be temporary and localized.

Human Health and Safety

For the LANL SWEIS (DOE 1999a) Expanded Operations Alternative, the MEI was conservatively located within the LANL reservation and would receive a dose of 5.44 mrem/yr, corresponding to a lifetime dose over 72 years of 390 mrem. Radiological impacts from the proposed relocation of TA-18 and the CMRR project are within the bounds of those estimated for the LANL SWEIS Expanded Operations Alternative. The dose to the MEI calculated as a result of airborne releases from the MPF is 1.2×10^{-7} mrem representing 2.2×10^{-8} percent of the LANL SWEIS Expanded Operations Alternative. The limit set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) is 10 mrem/yr for airborne releases of radioactivity. The background total effective dose equivalent in the Los Alamos area is estimated to be 360 mrem/yr; thus the cumulative dose to the MEI is 3.3×10^{-8} percent of the background dose.

For the population surrounding the LANL within a 80-km (50-mi) radius, the LANL SWEIS estimated a population dose of 33.1 person-rem per year for the Expanded Operations Alternative and an annual operations excess LCF risk of 0.017 (DOE 1999a). The incremental population dose and increased annual LCF risk associated with the MPF Alternative (450 ppy) is 1.0×10^{-6} and 5.0×10^{-10}, or 3.0×10^{-6} percent of the SWEIS Expanded Operations Alternative population dose and annual operation excess LCF risk.

Transportation

The incremental impacts from transportation associated with the operation of the MPF Alternative (450 ppy) would result in a total collective dose to workers of 1.8 person-rem and 0.00073 LCFs. For the general population, the collective dose was estimated at 2.9 person-rem and 0.0014 LCFs. For all radioactive shipments throughout the United States over approximately a 100-year timeframe (historical and projected through 2047) the potential worker dose has been estimated at 410,000 person-rem (approximately 160 LCFs) (DOE 2002p). For the general population the dose was estimated at 350,000 person-rem (approximately 180 LCFs) (DOE 2002p).

Waste Management Impacts

Waste generation would increase significantly if a MPF (450 ppy) were built at LANL. TRU waste volumes (1,130 m^3 [45,909 ft^3]) would increase 1,200 percent. Additionally, DOE expects to generate approximately 5,292 m^3 (186,885 ft^3) of TRU waste at LANL. An additional 42 m^3

(1,483 ft^3) of TRU waste from offsite generators would be brought to LANL. This waste would be transferred to WIPP or a new TRU waste repository similar to WIPP.

LLW from MPF operations (450 ppy) would increase at LANL by 900 percent. DOE has decided to expand LLW disposal at LANL and the new capacity could readily accommodate the projected LANL LLW volumes for 50-100 years.

There is sufficient disposal capacity for all other waste types forecast for operations at LANL. However, the contribution to cumulative waste management from decontamination and demolition of buildings, and environmental restoration programs could be large (DOE 2003). Construction and demolition wastes would be recycled and reused to the extent practicable. Solid wastes would be disposed of at the Los Alamos County Landfill or other appropriate permitted solid waste landfills.

5.8.3 Nevada Test Site

The No Action Alternative provides the baseline for the cumulative effects of the Proposed Action at NTS. The projected incremental environmental impacts of implementing the Proposed Action at NTS were added to the impacts of other present, past, and reasonably foreseeable future actions at or near NTS to obtain the cumulative impacts.

Primary sources of information for cumulative impacts at NTS, include the following DOE documents:

- *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*, DOE/EIS 0243, August 1996 (DOE 1996b)
- *Supplement Analysis for the Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*, DOE/EIS-0243-SA-01, July 2002 (DOE 2002i)
- *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*, DOE/EIS-0250, February 2002 (DOE 2002p)
- *Nevada Test Site Annual Site Environmental Report for Calendar Year–2001*, DOE/NV11718-747, October 2002 (NTS 2002)

Historically, the primary mission of the NTS, established in 1951, was to conduct nuclear weapons tests. In 1992, a moratorium on testing began, and the mission changed to maintain a readiness to conduct tests in the future if needed. Additionally, NTS missions now include national security, environmental management, stewardship of the NTS, and technology and economic diversification. Cumulative impacts at the NTS include historical impacts associated with weapons testing.

At NTS, resources that may reasonably be expected to be affected by the Proposed Action include electrical consumption, water use, air quality, human health and safety, transportation, and waste management.

Resource Requirements Impacts

For all capacities of the proposed MPF at NTS, both peak-load electrical capacity and available site electrical energy capacity would be exceeded. Compared to the No Action Alternative, operation of the MPF Alternative (producing 450 ppy) would result in a 133 percent increase in total electrical energy consumption, and 103 percent in peak load electrical energy consumption. Improvements to the electrical power capacity would be required if the MPF were sited at NTS. Additionally, NTS does not use natural gas or coal which are necessary for the production of steam for heating. Coal would have to be transported to the site, or a natural gas pipeline installed.

For water supply, the maximum increase over existing water use at NTS would be 6.3 percent of NTS's maximum production capacity (8 billion L/yr [2.1 billion gal/yr]) and 9.8 percent of the sustainable site capacity (5.15 billion L/yr [1.36 billion gal/yr]). If the proposed Advanced Accelerator were built at NTS, water use during construction and system initialization (4.9 billion L/yr [1.3 billion gal/yr]) would be on the order of the peak historic withdrawal rate (DOE 2002e). Annual operational consumption for the Advanced Accelerator could be up to 980 million L/yr (258.9 million gal/yr) (DOE 2002i).

Air Quality Impacts

Cumulative impacts on air quality at NTS were examined including all anticipated foreseeable actions at the NTS (DOE 2002i) and the Yucca Mountain Repository (DOE 2002p). Nonradiological pollutants would be generally less than 10 percent of applicable regulatory limits for all reasonably foreseeable actions (DOE 2002p, DOE 2002i), and less than 1 percent for MPF alternatives. Radiological releases would result in an annual dose to the MEI of 2.5 mrem (or 16.7 percent of the 40 CFR 63.204 limit of 15 mrem from radioactive releases from the repository and the NTS). Effects on air quality from associated construction and excavation activities would be temporary and localized.

Human Health and Safety

For the NTS, the *Supplement Analysis for the Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE 2002i) examined existing and proposed new projects since the original EIS was issued in 1996. The radiological impacts from the combination of existing and proposed new projects at NTS are within the bounds of the 1996 EIS. The great distances from the areas in which operations are conducted to the nearest members of the public ensures that routine operations have negligible offsite health impacts. The dose to the MEI calculated as a result of airborne releases from the MPF is 4.5×10^{-9} mrem representing 2.0×10^{-7} percent of the combined NTS and Yucca Mountain repository dose from all current and proposed activities. The limit set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) is 10 mrem/yr for airborne releases of radioactivity. In the Yucca Mountain Repository EIS (DOE 2002p) the combined total doses from repository activities and NTS activities was estimated to be 2.3 mrem to the MEI (1.2×10^{-6} LCF risk) and 42 person-rem to the population (0.021 LCF risk). The total dose from natural background radiation in the NTS area is estimated to be 314 mrem/yr (see Section 4.3.9); thus the cumulative dose to the MEI is 1.4×10^{-9} percent of the background dose. Emissions from past nuclear weapons testing could

have resulted in a dose of 150 mrem over the lifetime of those individuals exposed during atmospheric weapons testing. The incremental population dose and increased annual LCF risk associated with the MPF Alternative (450 ppy) is 7.7×10^{-8} and 3.8×10^{-11} LCF, or 1.8×10^{-7} percent of the population dose and annual operation excess LCF risk from NTS and Yucca Mountain combined.

Transportation

Incremental impacts from transportation associated with the MPF Alternative would be added to the impacts of the radioactive waste shipments to both NTS and the Yucca Mountain Repository. This increment can be compared to both all shipments to NTS and Yucca Mountain Repository, and all shipments of radioactive materials throughout the United States. The incremental impacts from transportation associated with the operation of the MPF Alternative (450 ppy) would result in a total collective dose to workers of 5 person-rem and 0.002 LCFs. For the general population, the collective dose was estimated at 7.7 person-rem and 0.0039 LCFs. The general population dose from transportation of radioactive shipments to the NTS projected in the NTS EIS (DOE 1996b) is 150 person-rem (this number includes the worker dose). For maximum shipments to the Yucca Mountain Repository (Module 2 with mostly truck shipments) the worker dose was estimated at 60,000 person-rem (24 LCFs) and the general population dose 9,700 person-rem (5 LCFs). For all radioactive shipments throughout the United States over approximately a 100-year timeframe (historical and projected through 2047) the potential worker dose has been estimated at 410,000 person-rem (approximately 160 LCFs) (DOE 2002p). For the general population the dose was estimated at 350,000 person-rem (approximately 180 LCFs) (DOE 2002p).

Waste Management Impacts

Waste generation would increase significantly if a MPF (450 ppy) were built at NTS. NTS does not generate TRU waste, but does manage about 600 m^3 (21,189 ft^3) of legacy waste transferred to NTS from offsite generators pending disposal at WIPP. The MPF project would generate an additional 1,300 m^3 (45,909 ft^3) of waste at 450 ppy. This waste would be transferred to WIPP or a new TRU waste repository similar to the WIPP.

NTS generates very little LLW although it manages large volumes of LLW as a national disposal site for LLW. LLW from MPF (450 ppy) could amount to 5,030 m^3/yr (177,633 ft^3/yr) of operation. This quantity of LLW is well within the capacity of NTS LLW disposal. In 2000, DOE projected a need for 1.1 million m^3 (38.8 million ft^3) of the LLW disposal capacity (approximately 30 percent). Disposal of Yucca Mountain Repository LLW would require up to 9 percent of the reserve capacity of 2.6 million m^3 (91.8 million ft^3) (DOE 2002p).

While the annual sanitary waste generated by the MPF project would only represent less than 3.3 percent of the disposal capacity (210,000 m^3 [7.4 million ft^3]) of the Area 23 landfill, up to 290,000 m^3 (10.2 million ft^3) could be generated by the Yucca Mountain Repository (DOE 2002p). Thus, solid sanitary waste disposal at NTS would require expansion to accommodate Yucca Mountain Repository waste.

5.8.4 Pantex Site

The No Action Alternative provides the baseline for the cumulative effects of the Proposed Action at Pantex. The projected incremental environmental impacts of implementing the Proposed Action at Pantex were added to the impacts of other present and reasonably foreseeable future actions at or near Pantex to obtain the cumulative impacts. To obtain information for cumulative impacts at Pantex, the following DOE documents were examined:

- *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Component*, DOE/EIS-0225, November 1996 (DOE 1996d)
- *Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*, DOE/EIS-0225/SA-03, April 2002 (DOE 2002e)
- *Surplus Plutonium Disposition Final Environmental Impact Statement*, DOE/EIS-0283, November 1999 (DOE 1999h)
- *2001 Site Environmental Report for Pantex Plant*, DOE/AL/66620-2002, December 2002 (BWXT 2002c)
- *Pantex Plant FY2003 10-Year Comprehensive Site Plan*, October 2002 (Pantex 2002)
- *Environmental Information Document in Support of the National Environmental Policy Act Documents for Pantex Plant* (BWXT 2002a)

Pantex was originally built for the U.S. Army during World War II to produce conventional munitions bombs and artillery projectiles. After the war, the plant was deactivated and eventually sold to Texas Technological College. In 1951, the plant was transferred back to the U.S. Government and was used to assemble nuclear weapons.

At Pantex, resources that may reasonably be expected to be affected by the Proposed Action include electrical consumption, water quality, air quality, human health and safety, transportation, and waste management.

Resource Requirements Impacts

If Pantex were selected for the MPF, site capacity for electrical power would be exceeded. Improvements in electrical capacity would be required for both the production of 250 ppy and 450 ppy. Operation of the MPF Alternative (producing 450 ppy) would result in a 147 percent increase above the available capacity of the electrical energy system.

In the Ogallala aquifer (underlying Pantex), regional groundwater withdrawals and long-term pumping exceed the natural recharge rate (DOE 2002e). The large water demands, including irrigation, in the Amarillo area are primarily responsible for the drop in the water table. Pantex withdrawals have decreased over time, with a 29 percent reduction from 1995-2000 (DOE 2002e). While there is no limit on the quantity of water Pantex can pump from the aquifer, the proposed water use of 996.3 million L/yr (263.2 million gal/yr) for the proposed MPF (450 ppy)

represents a 102.5 percent increase in water use for Pantex, thereby adding to the cumulative drawdown of the aquifer.

Air Quality Impacts

Cumulative impacts on air quality at Pantex include the impacts of existing operations combined with impacts from the construction of the MPF Alternative at Pantex. For most nonradiological pollutants the maximum incremental concentration increases would be less than 1 percent. Although releases of radiological materials from the MPF would be low, most of the increased release would be from plutonium, which is not currently emitted by Pantex. However, the MEI would receive a dose of 0.00000005 mrem/yr compared to the DOE and EPA standard of 10 mrem/yr. Effects on air quality from associated construction and excavation activities would be temporary and localized.

Human Health and Safety

For the Pantex, the dose to the MEI in 2001 was estimated to be 1.31×10^{-5} mrem (BWXT 2002c). The dose to the MEI calculated as a result of airborne releases from the MPF is 5.0×10^{-8} mrem representing 0.38 percent of the current Pantex annual MEI dose. The limit set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) is 10 mrem/yr for airborne releases of radioactivity. The annual dose in the vicinity of Pantex from background of radiation was estimated at 335 mrem/yr (see Section 4.4.9). Thus the cumulative dose to the MEI is 3.9×10^{-6} percent of the background dose.

For the population surrounding Pantex within an 80-km (50-mi) radius, the 2000 estimated population dose is 0.000136 person-rem per year (BWXT 2002c), resulting in an annual operations excess LCF risk of 6.8×10^{-8}. The incremental population dose and increased annual LCF risk associated with the MPF Alternative (450 ppy) is 3.6×10^{-7} person-rem/yr and 1.8×10^{-10}, or 0.26 percent of the annual population dose and annual operation excess LCF risk.

Transportation

The incremental impacts from transportation associated with the operation of the MPF Alternative (450 ppy) would result in a total collective dose to workers of 10.2 person-rem and 3.8×10^{-3} LCFs. For the general population, the collective dose was estimated at 8.0 person-rem and 3.4×10^{-3} LCFs. For all radioactive shipments throughout the United States over approximately a 100-year timeframe (historical and projected through 2047) the potential worker dose has been estimated at 410,000 person-rem (approximately 160 LCFs). For the general population the dose was estimated at 350,000 person-rem (approximately 180 LCFs).

Waste Management Impacts

Waste generation would increase significantly if a MPF were built at Pantex. Currently, there is no TRU waste generated at Pantex, and 1,300 m^3 (45,909 ft^3) of TRU waste would be generated if Pantex (450 ppy) were selected for the MPF. This waste would be transferred to WIPP on a new TRU waste repository similar to the WIPP.

LLW from MPF operations (450 ppy) would increase at Pantex by a factor of 59. The LLW generated would need to be transported to NTS for disposal, increasing transportation risks.

Annual solid sanitary waste generated by a MPF at Pantex would increase by a factor of 11 relative to current Pantex operations. This would increase the rate at which DOE would consume the available capacity of onsite or offsite facilities.

There is sufficient disposal capacity for all other waste types forecast for operations at Pantex.

5.8.5 Savannah River Site

The No Action Alternative provides the baseline for the cumulative effects of the Proposed Action at SRS. The projected incremental environmental impacts of implementing the Proposed Action at SRS were added to the impacts of other present, past and reasonably foreseeable future actions at or near SRS to obtain the cumulative impacts.

Primary sources of information for cumulative impacts at SRS, include the following DOE documents:

- *The Savannah River Site High-Level Waste Tank Closure Final Environmental Impact Statement*, DOE/EIS-0303, May 2002 (DOE 2002f)
- *Savannah River Site Waste Management Final Environmental Impact Statement*, DOE/EIS-0217, July 1995 (DOE 1995b)
- *Final Environmental Impact Statement Construction and Operation of a Tritium Extraction Facility at the Savannah River Site*, DOE/EIS-0271 March 1999 (DOE 1999b)
- *Savannah River Site Salt Processing Final Supplemental Environmental Impact Statement*, DOE/EIS 0082-S2, June 2001 (DOE 2001d)
- *Surplus Plutonium Disposition Final Environmental Impact Statement*, DOE/EIS-0283, November 1999 (DOE 1999h)
- *Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*, DOE/EIS-0306, July 2000 (DOE 2000e)
- *Savannah River Site Environmental Report for 2001*, WSRC-TR-2001-00474, 2002 (WSRC 2002h)

In order to determine cumulative impacts of current and future planned activities in the region, historical environmental impacts were also examined. In 1950, the Savannah River Plant (now SRS) was created for construction and operation of facilities required to produce nuclear fuels for the nation's defense. Normal operations included emissions of both radioactive and nonradioactive pollutants to the surrounding air and onsite steams. Thermal impacts were severe in the nearby streams because of cooling water releases. Contamination of onsite groundwater occurred due to seepage from waste sites and seepage basins (DOE 2002f). In 1988, DOE placed the active site reactors on standby, and at the end of the Cold War they were permanently shutdown. Once the reactors were shutdown, environmental indicators improved rapidly. For example, by 1996 the dose to the MEI decreased to about one eighth of its 1987 value (DOE

2002f). The combination of mitigation measures and environmental restoration efforts has demonstrated a trend of improved environmental quality (DOE 2002f). Groundwater modeling indicates that most contaminants have reached their peak concentration. However, some slow-moving contaminants will peak in the coming millennium. Additional discussion of historical environmental impacts and trends in improving environmental quality is contained in the *Savannah River Site High-Level Waste Tank Closure Final Environmental Impact Statement* (DOE 2002f).

Other nuclear facilities and numerous existing and planned industrial facilities have been examined for their potential cumulative impacts when combined with the effects of the proposed MPF. Previous analyses (DOE 2002f) has indicated that for the nuclear facilities in the surrounding area, only the Vogtle Electric Generating Plant has any effect on cumulative impacts in the area of the SRS, and that impact was found to be minimal. Because of the distance between SRS and other industrial facilities, comingling of effluents is unlikely to occur (DOE 2002f). Ambient levels of pollutants have remained below regulatory levels in and around the SRS region (DOE 2002f, WSRC 2002h).

Resources that may reasonably be expected to be affected by the proposed MPF at SRS include air quality, human health and safety, transportation, and waste management. These impacts were examined in the context of cumulative effects at the SRS and the surrounding area. No impacts to water quality or availability are anticipated (see Section 5.5.4) and there would be negligible impacts to site infrastructure (electrical energy demands, fuel and process gases).

Air Quality Impacts

Cumulative impacts on air quality at SRS include the impacts of reasonably foreseeable actions at SRS. Both radiological and nonradiological increases would be less than 1 percent of emissions from reasonably foreseeable action. The MEI would receive a dose of 8×10^{-9} mrem/yr compared to the DOE and EPA standard of 10 mrem/yr. Effects on air quality from associated construction and excavation activities would be temporary and localized.

Human Health and Safety

For SRS, baseline radiological doses were obtained from the *Savannah River Site Environmental Report for 2001* (WSRC 2002h). For 2001, the total dose from airborne and water releases to the MEI was estimated to be 0.18 mrem. For other foreseeable SRS activities[1] and the Vogtle Plant the MEI would receive an additional dose of 0.17 mrem/yr (DOE 2002f), corresponding to a lifetime dose over 72 years of 390 mrem. The dose to the MEI at the SRS boundary calculated as a result of airborne releases from the MPF (450 ppy) is 8.0×10^{-9}. The limit set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) is 10 mrem/yr for airborne releases of radioactivity. The average annual dose received by a typical resident in the Central Savannah River Area from background radiation is estimated to be 293 mrem/yr (see Section 4.5.9); thus the cumulative dose to the MEI is 2.7×10^{-9} percent of the background dose.

[1] Includes Spent Nuclear Fuel, Enriched Uranium, Tritium Extraction Facility, Management of Certain Plutonium Residues and Scrub Alloy Concentrations, Defense Waste Processing Facility, and Disposition of Surplus Plutonium (Pit Disassembly and Conversion Facility, Mixed Oxide Fuel Fabrication Facility, and Immobilization Facility), Sodium-Bonded Spent Nuclear Fuel, and components from throughout the DOE complex.

For the population surrounding the SRS (the Central Savannah River Area) within a 80-km (50-mi) radius, the total population dose, including baseline doses, other foreseeable SRS activities[1], and the Vogtle Plant, was estimated to be 10.8 person-rem per year (DOE 2002f). The estimated annual excess LCF risk for this dose is 0.0054. The incremental population dose and increased annual LCF risk associated with the MPF Alternative (450 ppy) is 1.3×10^{-6} person-rem and 6.5×10^{-10}, or 1.2×10^{-5} percent, of the total population dose and annual operation excess LCF risk.

Transportation

The incremental impacts from transportation associated with the operation of the MPF Alternative (450 ppy) would result in a total collective dose to workers of 6.4 person-rem and 2.5×10^{-3} LCFs. For the general population, the collective dose was estimated at 12 person-rem and 5.9×10^{-3} LCFs. For all radioactive shipments throughout the United States over approximately a 100-year timeframe (historical and projected through 2047) the potential worker dose has been estimated at 410,000 person-rem (approximately 160 LCFs) (DOE 2002p). For the general population the dose was estimated at 350,000 person-rem (approximately 180 LCFs).

Waste Management Impacts

Waste generation would increase significantly if a MPF (450 ppy) were built at SRS. TRU waste volumes (1,300 m^3 [45,909 ft^3]) would increase by a factor of 14. Additionally, DOE expects to generate approximately 720 m^3 (25,427 ft^3) of TRU waste at SRS after the scheduled closure of WIPP in 2035. This waste would be transferred to WIPP or a new TRU waste repository similar to the WIPP.

LLW from MPF operations (450 ppy) would increase at SRS by 92 percent. The estimated capacity of the onsite disposal facility is 250,000 m^3 (8.8 million ft^3) and the projected total volumes for all ongoing and anticipated projects at the SRS over the next 30 years are about 450,000 m^3 (15.8 million ft^3) (DOE 2002f). The projected volume of LLW from MPF operations (450 ppy) is 251,000 m^3 (8.8 million ft^3).

There is sufficient disposal capacity for all other waste types forecast for operations at SRS.

5.8.6 Carlsbad Site

The No Action Alternative provides the baseline for the cumulative effects of the Proposed Action at the Carlsbad Site. The projected incremental environmental impacts of implementing the Proposed Action at the Carlsbad Site were added to the impacts of other present, past and reasonably foreseeable future actions at or near WIPP to obtain the cumulative impacts.

[2] Includes Spent Nuclear Fuel, Enriched Uranium, Tritium Extraction Facility, Management of Certain Plutonium Residues and Scrub Alloy Concentrations, Defense Waste Processing Facility, and Disposition of Surplus Plutonium (Pit Disassembly and Conversion Facility, Mixed Oxide Fuel Fabrication Facility, and Immobilization Facility), Sodium-Bonded Spent Nuclear Fuel, and components from throughout the DOE complex.

Primary sources of information for cumulative impacts at the Carlsbad Site, include the following DOE documents:

- *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement*, DOE/EIS-0026-S2, September 1997 (DOE 1997b)
- *Waste Isolation Pilot Plant 2001 Site Environmental Report*, DOE/WIPP 02-2225, 2002 (WTRU 2002)

WIPP began operations in 1999 as the first underground repository to permanently dispose of TRU and mixed waste generated through the research and production of nuclear weapons and other national defense-related activities. In the latest annual site environmental report (WTRU 2002), no evidence of any adverse environmental effects on the surrounding environment was identified. At the Carlsbad Site, resources that may reasonably be expected to be affected by the proposed action include site infrastructure, water use, air quality, human health and safety, transportation, and waste management.

Resource Requirements Impacts

The existing power grid is capable of supplying sufficient electrical power to operate the MPF. Two new transformers also would be needed to upgrade the existing system to provide redundant electrical power to the MPF.

Currently, WIPP does not use natural gas, which is necessary for the production of steam for heating. A natural gas pipeline would need to be installed for the generation of steam (see Section 5.6.2).

For water supply, the percent change in water consumption from the No Action Alternative was an increase of 1,940 percent for MPF at 450 ppy. The annual water demand at 450 ppy would be 530.3 million L (140.1 million gal). However, WIPP has the capacity of 2.5 billion L (0.65 billion gal), and the increased water demand represents only 15 percent of the available capacity. Water is contracted from the Carlsbad municipal water system. No measurable impact on regional groundwater levels or availability would be expected.

Air Quality Impacts

Cumulative impacts on air quality at the Carlsbad Site include the impacts of existing operations combined with impacts from the construction of the MPF Alternative at the Carlsbad Site. For most nonradiological pollutants the maximum incremental concentration increases would be less than 1 percent. Although releases of radiological materials would be low, most of the increase is due to a potential release of plutonium, which is not currently emitted by WIPP. The MEI would receive a dose of 6.5×10^{-8} mrem/yr from MPF operations, compared to the MEI dose of 0.0000899 mrem (WTRU 2002) for current WIPP operations. The DOE and EPA standard is 10 mrem/yr. Effects on air quality from associated construction and excavation activities would be temporary and localized.

Human Health and Safety

For WIPP, the dose to the MEI in 2001 was estimated to be 8.99×10^{-5} mrem (WTRU 2002). The dose to the MEI calculated as a result of airborne releases from the MPF is 6.5×10^{-8} mrem representing 0.072 percent of the current WIPP annual MEI dose. The limit set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) is 10 mrem/yr for airborne releases of radioactivity. The annual dose in the vicinity of WIPP from natural sources of radiation was estimated at 295 mrem/yr (see Section 4.6.9). Thus the dose to the MEI is 2.2×10^{-8} percent of the background dose.

For the population surrounding WIPP within an 80-kilometer radius, the estimated LCF risk is 3×10^{-4} (DOE 1997b), which translates to a population dose of 0.6 person-rem. The incremental population dose and increased annual LCF risk associated with the MPF Alternative (450 ppy) are 1.2×10^{-7} person-rem and 6.2×10^{-11}, which would represent 0.00002 percent of dose and LCF risk from DOE operations at WIPP.

Transportation

Incremental impacts from transportation associated with the MPF alternative would be added to the impacts of the TRU waste and mixed waste shipments to WIPP for disposal. This increment can be compared to both all shipments to WIPP, and all shipments of radioactive materials throughout the United States. The incremental impacts from transportation associated with the operation of the MPF Alternative (450 ppy) would result in a total collective dose to workers of 9.4 person-rem and 0.0037 LCFs. For the general population, the collective dose was estimated at 7.0 person-rem and 0.0035 LCFs. For transportation of all TRU and mixed waste to WIPP from throughout the United States, a total of 3 LCFs was estimated (DOE 1997b) for the general population, which translates to a population dose of 6,000 person-rem. The occupational LCF risk for all shipments to WIPP has been estimated to be 0.3 (DOE 1997b). For all radioactive shipments throughout the United States over approximately a 100-year timeframe (historical and projected through 2047) the potential worker dose has been estimated at 410,000 person-rem (approximately 160 LCFs). For the general population the dose was estimated at 350,000 person-rem (approximately 180 LCFs).

Waste Management Impacts

WIPP currently manages only small quantities of site-generated waste, therefore MPF operations would require a substantial increase in the waste management infrastructure at WIPP. TRU waste generated from MPF operations would be transferred to the WIPP Waste Handling Building or a new TRU waste repository similar to the WIPP.

LLW and mixed LLW from MPF operations (450 ppy) would be shipped offsite for disposal. The analysis assumes LLW would be transported to NTS for disposal (see Section 5.6.13). There is currently no infrastructure at the Carlsbad Site to support storage of LLW or mixed LLW until it can be shipped offsite for disposal.

For MPF operating at 450 ppy, the projected sanitary wastewater volume would be 224,000 L/day (59,000 gal/day). The discharge limit for the current WIPP sewage treatment

facility is 87,065 L/day (23,000 gal/day). Even at the lowest operating capacity of MPF, the capacity of the sewage treatment plant would be exceeded and would require expansion.

Solid sanitary wastes generated by MPF (450 ppy) would be expected to increase the total from WIPP by a factor of 12. This would accelerate DOE's consumption of available capacity in both onsite and offsite facilities.

5.9 UNAVOIDABLE ADVERSE IMPACTS

Implementing any of the MPF alternatives analyzed in this EIS would result in unavoidable adverse impacts on the environment. Generally, the impacts are small and would be from the construction and operation of new facilities at any one of the five locations analyzed.

Operations at Los Alamos Site, NTS, SRS, Pantex Site, or Carlsbad Site would all result in unavoidable radiation exposure to workers and the general public. Workers would be exposed to direct radiation and other chemicals associated with operating MPF and handling and transporting radioactive waste. The public would be exposed to radioactive contaminants released to the air and through exposure to radioactive materials, including waste, that would be transported both to the proposed MPF and to ultimate disposition sites for radioactive wastes. Discussion of the health effects to workers and the public is included in Sections 5.2.9, 5.3.9, 5.4.9, 5.5.9, and 5.6.9. Potential transportation impacts are described in Sections 5.2.12, 5.3.12, 5.4.12, 5.5.12, and 5.6.12.

Unavoidable quantities of radioactive and nonradioactive wastes would be generated by implementing any of the MPF alternatives. This waste would need to be segregated, stored, managed, and transported to final disposal locations.

Discussion of Air Impacts

For all alternatives, various chemical and radiological constituents would be released to the air. Generally, nonradiological releases would result in incremental increases of less than 1 percent. For radiological releases, while the incremental increases compared to the baseline and all reasonably foreseeable actions is large for most alternatives, the actual releases for all alternatives would result in a dose significantly less than the DOE and EPA standard of 10 mrem/yr. Additionally, there would be temporary and localized effects on air quality from associated construction and excavation activities.

There would also be temporary impacts from the construction of new facilities associated with the MPF project. These impacts would consist of increased fugitive dust, increased potential for erosion and stormwater pollution, and increased construction vehicle traffic and emissions.

5.10 RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM USES

Implementation of any of the alternatives would require short-term commitments of resources such as land use and permanent commitment of resources such as energy.